WHAT IS CLAIMED IS:

    1.   A method for operating a machine vision inspection system to inspect a workpiece having a highly-textured or low-contrast surface and having at least one line to be determined present in or on the highly-textured or low-contrast surface, the at least one line to be determined arranged in an arrangement that is characteristic of that type of workpiece, the method comprising:

    capturing a workpiece image of at least the portion of the workpiece having the highly-textured or low-contrast surface having the at least one line to be determined;

    processing the captured workpiece image to provide an enhanced image that enhances at least one characteristic of at least one of the at least one line to be determined;

    transforming the enhanced image using a transform that nominally generates a 2-dimensional set of values that include local extrema nominally corresponding to probable individual lines, the local extrema including proper-polarity local extrema having a polarity corresponding to the at least one line to be determined, the two dimensional coordinates of the local extrema usable to define the corresponding individual lines;

    determining the at least one line to be determined based on the 2-dimensional set of values, the determination further based at least partially on at least one previously defined line constraint corresponding to the arrangement that is characteristic of that type of workpiece.

    2.   The method of claim 1, wherein determining the at least one line to be determined comprises applying the at least one previously defined line constraint to restrict a selection of at least one of a) a selected set of at least one proper-polarity local extrema in the 2-dimensional set of values, the two dimensional coordinates of each local extrema in the selected set defining a corresponding line to be determined, and b) a selected set of at least one line to be determined, the selected set of at least one line to be determined being a subset of lines corresponding to a selected preliminary set of at least one proper-polarity local extrema in the 2-dimensional set of values, the two dimensional coordinates of each local extrema in the preliminary set defining a corresponding line.

    3.   The method of claim 2, wherein the at least one previously defined line constraint comprises at least one of a) a quantity constraint corresponding to a number

of the at least one line to be determined, and b) a geometric relationship constraint corresponding to a geometric arrangement of the at least one line to be determined in the arrangement that is characteristic of that type of workpiece.

4.   The method of claim 3, wherein the geometric relationship constraint comprises an angular orientation constraint comprising at least one of a) an angular orientation constraint corresponding to an angular relationship between at least one line to be determined and a line-like feature of the highly-textured or low-contrast surface, b) an angular orientation constraint corresponding to an angular relationship between at least one pair of lines to be determined, c) an angular orientation constraint corresponding to at least one pair of lines to be determined that are approximately parallel to one another, and d) an angular orientation constraint corresponding to an angular relationship between at least one line to be determined and a coordinate reference frame of the captured workpiece image.

5.   The method of claim 3, wherein the geometric relationship constraint comprises a line spacing constraint comprising at least one of a) a line spacing constraint corresponding to a line spacing between at least one line to be determined and a line-like feature of the highly-textured or low-contrast surface, b) a line spacing constraint corresponding to a line spacing between at least one pair of lines to be determined, c) a line spacing constraint corresponding to a line spacing between at least one pair of lines to be determined that are parallel to one another, and d) a line spacing constraint corresponding to a line spacing between at least one line to be determined and a coordinate reference frame of the captured workpiece image.

6.   The method of claim 3, wherein the selection of at least one of a) the selected set of at least one local extrema in the 2-dimensional set of values and b) the selected preliminary set of at least one local extrema in the 2-dimensional set of values comprises selecting at least one most extreme-valued proper-polarity local extremum that is included in a selection region of the 2-dimensional set of values as the set members.

7.   The method of claim 6, wherein the selection comprises selecting the at least one most extreme-valued proper-polarity local extremum and further comprises restricting the selected at least one most extreme-valued proper-polarity local extremum to those set members that also correspond to the conditions of at least one line constraint.

8.   The method of claim 6, wherein the selection of at least one of a) the selected set of at least one local extremum, b) the selected set of at least one line to be determined and c) the selected preliminary set of at least one local extremum comprises applying the quantity constraint to restrict the selection to a number of set members that is the same as the number of the at least one line to be determined.

9.   The method of claim 6, wherein the selection region of the 2-dimensional set of values comprises one of a) the entire 2-dimensional set of values and b) a restricted portion of the 2-dimensional set of values determined based at least partially on at least one line constraint.

10.   The method of claim 9, wherein the restricted portion of the 2-dimensional set of values determined based at least partially on at least one line constraint corresponds to the approximate vicinity of a one-dimensional proper-polarity global extremum of the 2-dimensional set of values.

11.   The method of claim 10, wherein the one-dimensional proper-polarity global extremum of the 2-dimensional set of values corresponds to a plurality of local extrema that have an angular orientation coordinate that is at least approximately the same for each of the plurality of local extrema.

12.   The method of claim 1, wherein processing the captured workpiece image to provide an enhanced image that enhances at least one characteristic of at least one of the at least one line to be determined comprises at least one of a) performing at least one operation that provides an expansion of at least some of the pixels of the image that correspond to at least one characteristic of the pixels of the at least one line to be determined and b) performing at least one operation that tends to increase the contrast between pixels corresponding to the at least one line to be determined and the highly-textured or low-contrast surface, on at least one of i) the pixels of the captured workpiece image and ii) pixels that have been processed by operations that include at least one expansion operation.

13.   The method of claim 1, wherein the at least one enhanced characteristic of the at least one line to be determined comprises at least one of a) a wider line width of the pixels representing the at least one line to be determined, b) an improved continuity of the pixels representing segments of the at least one line to be determined along a length direction of the at least one line to be determined, and c) an increase in a difference between an average pixel intensity of pixels representing

the at least one line to be determined and an average pixel intensity of pixels representing the highly-textured or low-contrast surface.

14.   A method for programming a machine vision inspection system to inspect a workpiece having a highly-textured or low-contrast surface and having at least one line to be determined present in or on the highly-textured or low-contrast surface, the at least one line to be determined arranged in an arrangement that is characteristic of that type of workpiece, the method comprising:

capturing a workpiece image of at least the portion of the workpiece having the highly-textured or low-contrast surface having the at least one line to be determined;

determining at least one image enhancement process for processing the captured workpiece image to provide an enhanced image that enhances at least one characteristic of at least one of the at least one line to be determined;

generating at least one part program instruction operable to perform the determined image enhancement process;

transforming the enhanced image using a transform that nominally generates a 2-dimensional set of values that include local extrema nominally corresponding to probable individual lines, the local extrema including proper-polarity local extrema having a polarity corresponding to the at least one line to be determined, the two dimensional coordinates of the local extrema usable to define the corresponding individual lines;

generating at least one part program instruction operable to perform the transforming process to generate the 2-dimensional set of values;

defining at least one line constraint corresponding to the arrangement that is characteristic of that type of workpiece;

determining a process for determining the at least one line to be determined based on the 2-dimensional set of values and at least partially on at least one defined line constraint;

generating at least one part program instruction operable to perform the process for determining the at least one line to be determined based at least partially on at least one defined line constraint;

storing a set of part program instructions including at least the part program instructions operable to perform at least the determined image enhancement process, the transforming process to generate the 2-dimensional set of values, and the

process for determining the at least one line to be determined based at least partially on at least one defined line constraint, the set of part program instructions at least operable to determine the at least one line to be determined on a workpiece of that type.

15.   The method of claim 14, wherein:

the image enhancement process comprises a previously determined technique, the previously determined technique governable by one or more selectable parameters; and

determining an image enhancement process comprises selecting values for the one or more selectable parameters to fully determine the image enhancement process for that type of workpiece.

16.   The method of claim 15, wherein determining an image enhancement process comprises:

iteratively determining the image enhancement process by selecting the values for the one or more selectable parameters;

observing a process result corresponding to the selected parameter values; and

repeating the selecting and results observing steps until the selected parameter values produce a satisfactory result.

17.   The method of claim 14, wherein:

the process for determining the at least one line to be determined comprises a previously determined technique, the previously determined technique governable by one or more selectable parameters; and

determining a process for determining the at least one line to be determined comprises selecting values for the one or more selectable parameters to fully determine the at least one line to be determined determining process for that type of workpiece.

18.   The method of claim 15 wherein determining a process for determining the at least one line to be determined comprises:

iteratively determining a process for determining the at least one line to be determined by selecting the values for the one or more selectable parameters;

observing a process result corresponding to the selected parameter values; and

repeating the selecting and results observing steps until the selected parameter values produce a satisfactory result.

19.   A method for operating a machine vision inspection system to inspect a workpiece having a highly-textured or low-contrast surface and having at least two lines to be determined present in or on the highly-textured or low-contrast surface, the at least two lines to be determined arranged in an arrangement that is characteristic of that type of workpiece, the method comprising:

capturing a workpiece image of at least the portion of the workpiece having the highly-textured or low-contrast surface having the at least two lines to be determined;

processing the captured workpiece image to provide an enhanced image that enhances at least one characteristic of the at least two lines to be determined;

transforming the enhanced image using a transform that nominally generates a 2-dimensional set of values that include local extrema nominally corresponding to probable individual lines, the local extrema including proper-polarity local extrema having a polarity corresponding to the at least two lines to be determined, the two dimensional coordinates of the local extrema usable to define the corresponding individual lines;

analyzing the 2-dimensional set of values to select at least two proper-polarity local extrema such that the selected at least two local proper-polarity extrema comprise most extreme-valued proper-polarity local extrema that also correspond to lines arranged in the arrangement that is characteristic of that type of workpiece; and

determining the at least two lines to be determined based on the two dimensional coordinates of the selected at least two local extrema.

20.   The method of claim 19, wherein the at least one enhanced characteristic of the at least two lines to be determined comprises at least one of a wider line width of the pixels representing the at least two lines to be determined, an improved continuity of the respective pixels representing segments of each of the at least two lines to be determined along respective length directions of the at least two lines to be determined, and an increase in a difference between an average pixel intensity of the pixels representing the at least two lines to be determined and an average pixel intensity of the pixels representing the highly-textured or low-contrast surface.

21.   A method for programming a machine vision inspection system to inspect a workpiece having a highly-textured or low-contrast surface and having at least two lines to be determined present in or on the highly-textured or low-contrast surface, the at least two lines to be determined arranged in an arrangement that is characteristic of that type of workpiece, the method comprising:

capturing a workpiece image of at least the portion of the workpiece having the highly-textured or low-contrast surface having the at least two lines to be determined;

determining an image enhancement process for processing the captured workpiece image to provide an enhanced image that enhances at least one characteristic of the at least two lines to be determined;

generating at least one part program instruction operable to perform the determined image enhancement process;

transforming the enhanced image using a transform that nominally generates a 2-dimensional set of values that include local extrema nominally corresponding to probable individual lines, the local extrema including proper-polarity local extrema having a polarity corresponding to the at least two lines to be determined, the two dimensional coordinates of the local extrema usable to define the corresponding individual lines;

generating at least one part program instruction operable to perform the transforming process to generate the 2-dimensional set of values;

determining a process for analyzing the 2-dimensional set of values to select at least two proper-polarity local extrema such that the selected at least two proper-polarity local extrema comprise most extreme-valued proper-polarity local extrema that also correspond to lines arranged in the arrangement that is characteristic of that type of workpiece;

generating at least one part program instruction operable to perform that process for analyzing the 2-dimensional set of values to select the at least two proper-polarity local extrema that comprise the most extreme-valued proper-polarity local extrema that also correspond to lines arranged in the arrangement that is characteristic of that type of workpiece; and

storing a set of part program instructions including at least the part program instructions operable to perform at least the determined image enhancement process, the transforming process to generate the 2-dimensional set of values and the

process for analyzing the 2-dimensional set of values to select at least two proper-polarity local extrema that comprise the most extreme-valued proper-polarity local extrema that also correspond to lines arranged in the arrangement that is characteristic of that type of workpiece, the set of part program instructions at least operable to determine the at least two lines to be determined on a workpiece of that type based on the selected at least two proper-polarity local extrema that comprise the most extreme-valued proper-polarity local extrema that also correspond to lines arranged in the arrangement that is characteristic of that type of workpiece.

    22.   The method of claim 21, wherein:

    the image enhancement process comprises a previously determined technique, the previously determined technique governable by one or more selectable parameters; and

    determining an image enhancement process comprises selecting values for the one or more selectable parameters to fully determine the image enhancement determining process for that type of workpiece.

    23.   The method of claim 21, wherein:

    the process for analyzing the 2-dimensional set of values to select the at least two proper-polarity local extrema that comprise the most extreme-valued proper-polarity local extrema that also correspond to lines arranged in the arrangement that is characteristic of that type of workpiece comprises a previously determined technique, the previously determined technique governable by one or more selectable parameters; and

    the process for analyzing the 2-dimensional set of values to select the at least two proper-polarity local extrema comprises selecting values for the one or more selectable parameters to fully determine the 2-dimensional set of values analyzing process for that type of workpiece.